Examining the relationships between municipal revenue sources in South Africa**

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Abstract

Although property tax, fiscal transfers and service charges are the major sources of revenue for municipalities in South Africa, it is worth noting that these municipalities can also mobilise revenue from other sources, including interests earned on investment activities. Except for property tax, services charges, and fiscal transfers, many municipalities in South Africa are generating significant revenue from interest on investments. This paper is the first attempt in the literature that empirically investigates whether South African municipalities strategically use revenue from interests earned on investments as a budget tool to either lighten the burden of property tax and service charges or to mobilise additional revenue to cover their expenditure. Information from municipalities' income statements is used by applying a two-level variance component model to account for heterogeneity that exists between municipalities located in different districts. Findings point to the existence of positive and significant relationships for an average municipality across district.

1 Introduction

Budgets of municipalities in South Africa are financed through own revenue sources and fiscal transfers. Own revenue include a variety of sources such as property tax, service charges and interests earned on investments. One feature of these own revenue sources is that municipalities have the discretion in the way they use them to finance any expenditure programmes in their budgets. One would expect some relationships that exist between own revenue sources because of their discretional nature. The objective of this paper is to understand how municipalities in South Africa combine revenue from interests earned on investments, property tax and service charges as sources to finance their budget. Also, the paper seeks to detect whether there are factors that similarly affect municipalities belonging to same districts. The research is purposely designed to provide answer to the following questions:

- Are South African municipalities using interests earned on investments as a tool to reduce the burden of property tax and service charges? and
- Is there any variability between district in the relationships between revenue from interests earned on investments, property tax and services charges?

This paper focuses on own revenue for these two reasons. First, property tax and service charges are the biggest sources that South African municipalities use to mobilise revenue. For instance, metropolitan and other municipalities in urban areas generate more than 80% of their revenue through property tax and service charges. Second, apart from property tax and service

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charges, interests earned on investments is also the biggest own revenue source that many municipalities in South Africa use to finance their budgets.

This paper argues that municipalities can strategically use interests earned from investment to reduce property tax or service charges burden. This can be empirically justified if a reduction of revenue from property tax or service charges corresponds with a simultaneous increase of interests earned on investments. Such behaviour can be explained by the political unpopularity of both property tax and service charges as major revenue sources. South African municipalities are required to follow a prescribed budget process that includes consultations with residents and other stakeholders to discuss budget proposals (i.e. property tax rates and tariffs). Municipalities always face the challenge of finding a balance between high levels of expenditure programmes, as a result of an ever increasing demand of services, and lower incomes, as a result of reluctance by communities to pay more taxes or tariffs for services. For these reasons, a rational municipal that has investments would prefer using earnings from these investments to finance its expenditure programme than increasing property tax and/service charge. Municipalities can use interests on investments as a tool to increase their revenue by diversifying the portfolio of revenue sources. This can be empirically tested if revenue from interests on investments and property tax or service charges move increase at the same time.

Moreover, the present paper hypothesises that change of revenue from property tax and service charges in a municipality is simultaneously explained by revenue from interests earned on investment in that municipality and by district random factors. In other words, in consistence many empirical studies on municipal finance, it is argued that municipalities that belong to the same district will have tendency to behave in a similar way for many reasons. There are various reasons to explain such behaviour by municipalities. First, municipalities belonging to the same district are exposed to similar social, economic and political context. Second, it is possible for municipalities in the same district to copycat fiscal behaviours of their neighbours. Most importantly, district random effects on the behaviour of municipalities may be visible or invisible, measurable or unmeasurable.

An empirical investigation is required to provide an adequate answer to the above posed question. The present paper uses therefore data on municipal income statements (also referred to as statement of financial performance) to extract variables on property tax revenue, service charges and interests earned on investments. This is complemented with other information on municipal demographic and economic dimensions to estimate a two-level variance component model in which revenue from interests earned on investments is considered as the principal predictor of property tax and service charge revenue alternatively.

Although, there are studies in the literature that investigate the relationships between municipal revenue sources, most of these studies only focus on property tax and local option sales tax (LOST). Also, the scope of most of these studies is limited to municipalities in the United States. As cited in these studies, including Whiney (2013), Jung (2001), Sjoquist, Walker and Wallace (2005), LOST is the second biggest revenue source for US local governments. Section 219 (1) (a) of the Constitution (1996) prohibits South African municipalities to levy any sales tax. Instead, as discussed in earlier paragraphs, municipalities in South Africa have other sources of revenue in addition to property tax, service charges and fiscal transfers. To the author's best knowledge there is not yet a study in the literature that focuses on interests earned on investments made by municipalities as sources of revenue. There is also not yet a study that investigates the relationships between municipal revenue sources in South Africa.

This paper is structured as follows. Section 2 presents a brief discussion on the literature review related to this paper. Section 3 presents the methodology used for analysis. Data used to carry out the analysis is discussed in Section 4. The empirical results are discussed in Section 5, and section 7 concludes the paper.

2 Brief literature review

The issue of relationships between revenue sources for municipalities or local governments has preoccupied researchers for quite a long time. For instance, many decades ago, Deran (1968) investigated the effects of income tax on property tax in some US cities. She found that cities that levy income tax exhibit lower property tax as percentage of total tax, lower per capita property tax and lower per capita taxes than cities that don't have income tax. Inman (1979) also examine the issue and found that for local governments that levy sales taxes, there is a negative correlation between sales taxes and property.

In 2000s, the topic has again resurfaced with Jung (2001) examining the effect of LOST on property tax, millage tax and total spending in 136 counties in Georgia, in the United States, for a period of 13 years. This author found that there was property tax relief when LOST was levied. This was partly due to the fact the Georgia law requires that local government rollback property taxes when levying LOST. Afonso (2014) uses budget information of counties in 13 states in the United States for a 20-year period to examine the effect of LOST on property tax burden. Her findings show that counties use LOST as a tool to decrease property tax and increase own revenue.

Findings by Sjoquist, Walker and Wallace (2004) are quiet interesting. These authors conclude that there are two types of local governments. Some local governments exclusively use LOSTs to reduce the burden of property tax, whereas for other local governments LOSTs are used as to tool to simultaneously reduce property tax burden and increase the levels of expenditure.

There are many other studies in the literature that follow similar approaches as the ones cited above. The aim of this section is not to discuss them, but to identify gaps or areas that have not yet been explored and demonstrate the contribution of the present study to scientific knowledge. In this regard, the review of the literature points out these two observations. First, the scope in most studies is limited to focusing on property tax and income and sales tax levied by local governments or municipalities. Municipalities, in particular those in South Africa, have also non-tax revenue sources, such as service charges, interests earned on investments and other fees. It is important to extend the understanding by including other sources that have been left out in the literature.

Second, these studies mainly focus on local governments or municipalities in the United States. Municipalities or local governments operate in different regulatory and socio-economic environment from one country to the other. Consequently, inferences drawn for municipalities in one country or a group of countries (in this case, developed countries) may not be applicable or relevant to municipalities in other countries. It is therefore for important that the analysis is also done for municipalities in countries that have been overlooked in the literature.

To the author's best knowledge, there is not yet a study that specifically investigate the relationships between revenue from interests earned on investments, property tax revenue and service charges revenue for municipalities or local governments. Also, there is not yet a study that examines the topic using the case of South Africa.

3 Methodology

3.1 A two-level variance component model

The approach used in this paper is to specify a two-level variance component model to investigate the relationships that exist between revenue from interests earned on investments, property tax revenue and service charges revenue while taking into account similarities between municipalities belonging to the same districts. For this specification to be econometrically sound and relevant, it is required that sample exhibits a multilevel structure. It is therefore important to discuss about the structure of local government in South Africa.

Local government in South Africa is constituted by there are three categories of municipalities. Metropolitan municipalities belong to the first category A, whereas local and district municipalities belong to categories B and C respectively (Constitution, 1996). The most important feature of this categorisation is that, to the exception of metropolitan municipalities, South Africa has a two-tier system of local government. At the upper tier there is a district municipality, while at the lower tier there are two or more local municipalities. In other words, local municipalities fall under district municipalities. Local municipalities that fall within a district municipality share the expenditure responsibilities and revenue powers of that district. Figure 1 below is a snapshot representation to illustrate the structure of municipalities in South Africa.

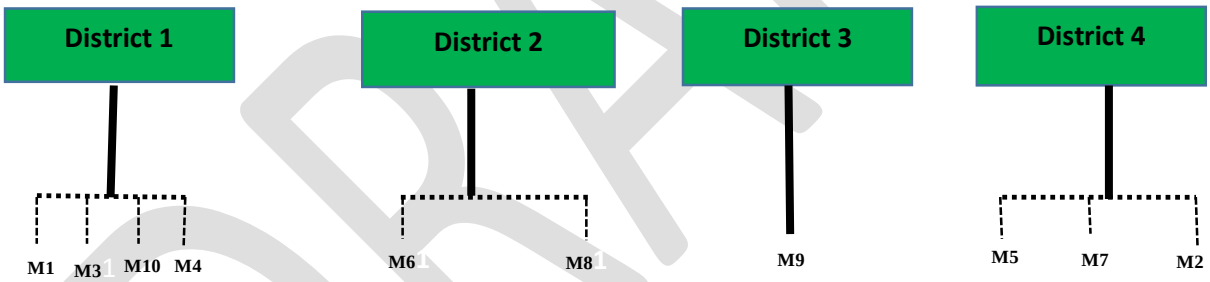

Figure 1. Unit diagram of a two-level hierarchical structure: municipalities nested in districts

First, it can be seen from Figure 1 that there is a hierarchy in this structure in the sense that any local municipality (symbolised by M on the graph) randomly taken belongs to one district only. In other words, there are no municipalities that belong to more than one district. Therefore, there are two levels in this hierarchical structure. Local municipalities are Level 1, whereas district municipalities at Level 2.

Second, as metropolitan municipalities do not fall under any district municipality, this paper adopts the following strategy to ensure that they are considered in the analysis. Each metropolitan municipality is first considered as a local municipality and then as a district municipality. For instance, the City of Cape Town, which is a metropolitan municipality, is considered as a municipality at level 1 and a district at level 2. Figure 1 above illustrates such situation as there is a case where a district is shown to only have one municipality.

Third, there are three adjacent metropolitan municipalities in the province of Gauteng, namely the City of Johannesburg, the City of Tshwane and Ekurhuleni. Instead of considering

each of these metropolitans as a municipality and a district, this paper creates a fictitious district municipality to which they all belong. The creation of this fictitious district municipality implies that the three above cited metropolitan municipalities are affected by common external factors. Consequently, the analysis takes into account all categories of municipalities without discriminating between local and metropolitan municipalities.

The reason for considering a two-level variance component model is mainly because of the structure of municipalities in South Africa as just above explained. As it is clearly explained in 3.2 and 3.3, the adopted model acknowledges and accounts for the influence that external factors at the district level (level 2) have on the variables at municipality level. As a result, variables for municipalities belonging to the same district will be correlated. If a single-level instead of a multilevel linear model is specified to test the hypothesis put forward in this paper, while ignoring these external factors, it will lead to inefficient and inconsistent parameter estimates as the assumption of independence of variables at the municipal level. The two-level variance specification, which is one version of multilevel approach, is used to address this challenge in ensuring efficient and consistent estimates (Leckie, 2013).

Also, the adoption of a two-level variance component model in this paper is close to other empirical studies that examine the topic of municipal or local government finance. Most of these studies argue that municipalities' fiscal choices are simultaneously determined by internal factors and fiscal choices of neighbouring municipalities. As a result, they use the methods of spatial econometrics to investigate these fiscal choices while taking account of neighbouring municipalities' fiscal choices as well. Some of these studies include Allers and Elhorst (2005) who investigate how property tax rates determined by municipalities in the Netherland are influenced by property tax rates in their neighbouring municipalities. Bordignon, Cerniglia and Revelli (2003) also study interactions of property tax rates among Italian municipalities. Similarly, Bosch and Solé-Ollé (2007) focus on interaction between Spanish municipalities in the determination of property tax and vehicle tax rates. Caldeira, Foucault and Rota-Graziosi (2010) are amongst the few that examine the interactions between municipalities with regard to tax determination in the African context. It is worth noting that in most of these studies neighbourliness is determined in terms of contiguity or similarities based other characteristics.

A two-level variance component model, as it is explained in the next section, takes account of these influences when examining the relationships between municipal revenue from interests earned on investments, property tax revenue and service charges revenue. By considering this model for the analysis, this paper hypothesises that property tax revenue and/or service charges revenue of municipalities belonging to one district are all influenced by the same district-level factors. As a result, these municipalities should exhibit similarities with regard to the property tax and service charges than municipalities belonging to different districts.

3.2 Model specification

Two specifications are discussed in this paper. For the first specification, municipal revenue from property tax is the dependent variable as set out in Equation (1) below.

$$\log(PT_{ij}) = \beta + \alpha_1 \log(Int_{ij}) + \alpha_2 Den_{ij} + \alpha_3 Edu_{ij} + \alpha_4 Une_{ij} + v_j + u_j \log(Int_{ij}) + e_{ij} \quad (1)$$

$v_j \sim N(0, \sigma_v^2)$;

$u_j \sim \mathrm{N}(0, \sigma_v^2)$; and

$e_{ij} \sim \mathrm{N}(0, \sigma_e^2)$

where PT_{ij} is property tax revenue for municipality i ($i = 1,..., N$) in district j ($j = 1,..., J$).

Equation (1) is a random slope two-level variance component model. There are two main parts in this specification, namely the fixed effects part $(\beta + \alpha_1 \log(Int_{ij}) + \alpha_2 Den_{ij} + \alpha_3 Edu_{ij} + \alpha_4 Une_{ij})$ and the random effects part $(v_j + u_j \log(Int_{ij}) + e_{ij})$. First, fixed effects part is discussed. β is commonly referred to as "the grand mean". It is the geometric mean property tax revenue across all municipalities in all districts. Int_{ij} is the variable of interest for the analysis and its associated parameter σ_1 is referred to as the "grand mean slope". It is the elasticity of revenue from property tax as a result of a percent change in revenue from revenue from interests earned on investments for an average municipality across all districts. Den_{ij}, Edu_{ij}, and Une_{ij} are the control variables at municipality-level. They represent respectively population density, number of people with secondary education, and number of unemployed in municipality i in district j with their associated parameters. The choice of the control variables is determined by the availability of information at municipal level and is in line with the empirical literature on municipal finance. The associated parameters of control variables are assumed to be fixed for all municipalities across all districts.

Second, with regard to the random effects in Equation (1), the parameters v_j, u_j and e_{ij} are district random effect at the intercept, district random effect at the slope $\log(Int_{ij})$ and the within-district effect, respectively. In other words, the first two parameters vary across districts but fixed for municipality belonging to the same districts, while the last for municipalities belonging to the same districts. In essence, the ransom effects in Equation (1) are just the components of the overall residuals. Consequently, the geometric mean of revenue from property any municipality belonging to district j is therefore equal to $(\beta + v_j)$. The intercepts for municipalities belonging to districts for which the estimated v_j are positive will be greater than the "grand mean", β. In contract, the intercepts for municipalities belonging to districts with negative v_j will be smaller than the "grand mean", β. The elasticity of revenue from property tax as a result to a percent change in revenue from interests earned on investments for any municipality belonging to district j is equal to $(\alpha_1 + u_j)$.

Equation (2) is the second model specification. Equation (2) is similar to Equation (1), expect for the dependent variable, which is now the logarithm of revenue from service charges. Therefore, discussions regarding the symbols and interpretation of parameters related to Equation (1) equally apply in this case. The next section discusses the procedure that this paper follows to estimate both Equation (1) and (2)

$$\log(SG_{ij}) = \beta + \alpha_1 \log(Int_{ij}) + \alpha_2 Den_{ij} + \alpha_3 Edu_{ij} + \alpha_4 Une_{ij} + v_j + u_j \log(Int_{ij}) + e_{ij} \qquad (2)$$

3.3 Estimation procedure

The first step is to estimate both Equations (1) and (2) with the Maximum Likelihood method (MLE) to obtain consistent parameters. After testing for the soundness of the estimated models, the second step consists of decomposing variances of $\log(PT_{ij})$ and $\log(SG_{ij})$ in Equations (1) and (2) can into three components, namely the variance components σ_v^2, σ_u^2 and σ_e^2. The first

is the between-districts variance at the intercept, the second is the between-districts variance at the slope, whereas the latter is known as the within-district variance. In other words, σ_v^2 is a measure of difference between districts across the county in reference to "grand mean" of revenue from property tax revenue (service charges). The variance component σ_u^2 is used to measure differences between districts in reference to the "grand mean slope", whereas the variance component σ_e^2 is an indicator for how municipalities are different within same districts.

The covariance between the district intercepts and slopes, σ_{vu} is also calculated, which can be positive or negative. For example, if σ_{vu}, β and α_1 are positive, it is an indication that districts with high intercepts ($\beta + v_j$) tend to have slope $(\alpha_1 + u_j)$ for $\log(Int_{ij})$ that are steeper than the average α_1, while districts with low intercepts ($\beta + v_j$) will have flatter slopes of log (Int_{ij}) than the average.

The third step consists of calculating the Variance Partition Coefficients (VPC) based on the variance components to interpret the variability between-districts and within-district. A VPC indicates the relative magnitude of a variance component. It is the proportion of the response variance that lie at each level of the model hierarchy. The between-district variance partition coefficient at the intercept is calculated is the ratio of the district variance at the intercept to the total variance:

$$VPC_v = \frac{\sigma_v^2}{\sigma_v^2 + \sigma_u^2 + \sigma_e^2} \tag{3}$$

The between-district variance at the slope of $\log(Int_{ij})$ is calculated as:

$$VPC_u = \frac{\sigma_u^2}{\sigma_v^2 + \sigma_u^2 + \sigma_e^2} \tag{4}$$

Similarly, the within-district between-municipality variance is calculated:

$$VPC = \frac{\sigma_e^2}{\sigma_v^2 + \sigma_u^2 + \sigma_e^2} \tag{5}$$

It is important to note that the value of VPC ranges from 0 to 1. For instance, if $VPC_v = 0$, it means that there are no differences between the overall intercept and any individual intercepts for districts. Whereas, if $VPC_u = 0.3$, it shows that 20% of variation at the slope of $\log(Int_{ij})$ is between districts.

4 Data used

Data at municipality-level or level 1 of the hierarchy is collected for analysis in the present paper. This data is comprised of three revenue items for 2015/16 financial year, notably property tax, service charges and interests earned on investments sourced the Statistics South Africa's publication called Financial Census for Municipalities (Statistics South Africa, 2016). The paper also uses information on population density, number of people aged 15 and above

with at least a secondary level education and number of unemployed people aged 15 and above at the municipality-level sourced at Quantec (2017).

Table 1. Summary of descriptive statistics for the variables used in the analysis

Variable	Min	Max	Mean	STD
Equation 1				
Property tax revenue*	0.0081	82.5917	1.1314	5.8842
Revenue from interests earned on investments*	0.0001	7.0504	0.0869	0.4897
Population density	0.3	2 979	108	299
Number of people with a secondary school education	528	1 226 841	47 231	143 314
Number of unemployed	522	563 736	25 093	67 856
Equation 2				
Service charges revenue*	0.0006	203.4157	2.8675	14.3206
Revenue from interests earned on investments*	0.0001	7.0503	0.0930	0.4925
Population density	0.3	2979	108	300
Number of people with a secondary school education	528	1 226 841	45 523	143 755 965
Number of unemployed	522	563 736	25 431	68 095

** Figure in per capita South African thousands Rand (at prices of 2012)*

The sample to estimate Equation (1) consists of 198 out of 233 local and metropolitan municipalities nested in 53 districts, whereas 181 out of 233 local and metropolitan municipalities nested in 52 districts are considered to estimate Equation (2). Table 1 above gives a summary of descriptive statistics for all variables used in the analysis. It can be seen from this table that there are significant disparities between South African municipalities in all aspects. For instance, there are municipalities with more capacity to mobilise resources through property tax, service charges and interests earned on investments than others. These is illustrated by gaps that exist between maximum and minimum values recorded from property tax revenue, service charges and interests earned on investments.

5 Empirical results

Results of the estimated two-level variance models are reported in Table 2 below. Model 1 refers to the estimates of Equation (1) in which logarithm of per capita real property tax revenue is the outcome. In Model 2, the logarithm of per capita real service charges revenue is the dependent variable. First, the Likelihood Ratio (LR) statistic, which compares each of these models to the single-level linear model is used for this purpose. If the null hypothesis $H_0 : \sigma_v^2 = \sigma_u^2 = \sigma_e^2 = 0$ is not rejected, it means that the single-level linear model fits well the data. The reported LR statistics in Table 2 are significant at 5% and 1% levels, respectively. This implies that the hull hypothesis of no district effects is rejected. Therefore, this is an indication that a two-level variance component specification fits well the data then a single-level linear model. It also means that taking into account district-level effects is crucial when analysing the relationships between revenue from interests earned on investments, property tax revenue and service charges revenue for South African municipalities.

Table 2. Estimates of the two-level variance component model

	Model 1	Model 2
Constant	0,50871*	0,84159*
	(0,083)	(0.063)
Fixed effects		
log(Revenue from interests earned on investments)	0,42783***	0,35324***
	(0,000)	(0,000)
Density	-0,00789	-0,001975
	(0,524)	(0,231)
Number of people with a secondary school education	0,00001*	0,00001
	(0,083)	(0,112)
Number of unemployed	-0,00002	-0,00002
	(0,195)	(0,207)
Random effects		
Variance		
Districts (constant)	0,75592	2,14701
Districts (slope)	0,03542	0,04343
Covariance	0,13720	0,21202
Municipalities	1,14343	2,91715
Total	1,93477	5,06416
Variance partition coefficient		
Districts (constant)	39%	41%
District (slope)	2%	1%
Municipalities	59%	58%
LR test	8.83**	23,04***
	(0.015)	(0,000)
Log likelihood	-340,51	-437,13
R^2	0,27	0,14
Number of districts	50	50
Number of municipalities	213	212

Source: Author's own calculations.
****, **, and * means significance at 1%, 5% and 10% level respectively. In Brackets are probabilities associated with for z-values obtained from bootstrap standard errors. In parentheses are probabilities obtained from bootstrap standard errors.*

Second, the estimated parameters of revenue from interests earned on investments are positive and statistically significant in the fixed effect part (for both Model 1 and 2). This suggests that a one percent increase in revenue from interests earned on investments corresponds to 0.4% increase in revenue from property tax, all things being equal (Model 1) across all districts. Also, a percent increase in revenue from interests earned on investments corresponds with 0.3% increase in revenue from service charges across all district, all other things constant.

However, the elasticity of revenue from property tax as a result of change in revenue from interests earned on investments for municipalities belonging to district j is equal to $(0.42+\hat{u}_j)$, whereas that of revenue from service charges amounts to $(0.35+\hat{u}_j)$. The fact that the parameter estimate α_1 for $\log(Int_{ij})$ in Models 1 is an indication of a positive relationships between revenue from interests on investments and property tax for an average municipality across all districts. But, depending on the magnitude and sign of the estimated

between-district effects u_j, this relationship could be either positive or negative for municipalities belonging to district j. The examination of the estimated u_j reveals the slopes of municipalities belonging to 27 out of 50 districts considered in the analysis will be negative. This is also illustrated in Figure 1 below as more many points on the plot are negative values located in the 1st and 4th quadrants[1]. Based on this, it can be said that on average South African municipalities do not use revenue from interests earned on investments as a tool to reduce the burden on property tax (service charges). But, for municipalities belonging to particular districts, interests earned on investments contribute to the reduction of property tax (service charges) burden due district specific factors.

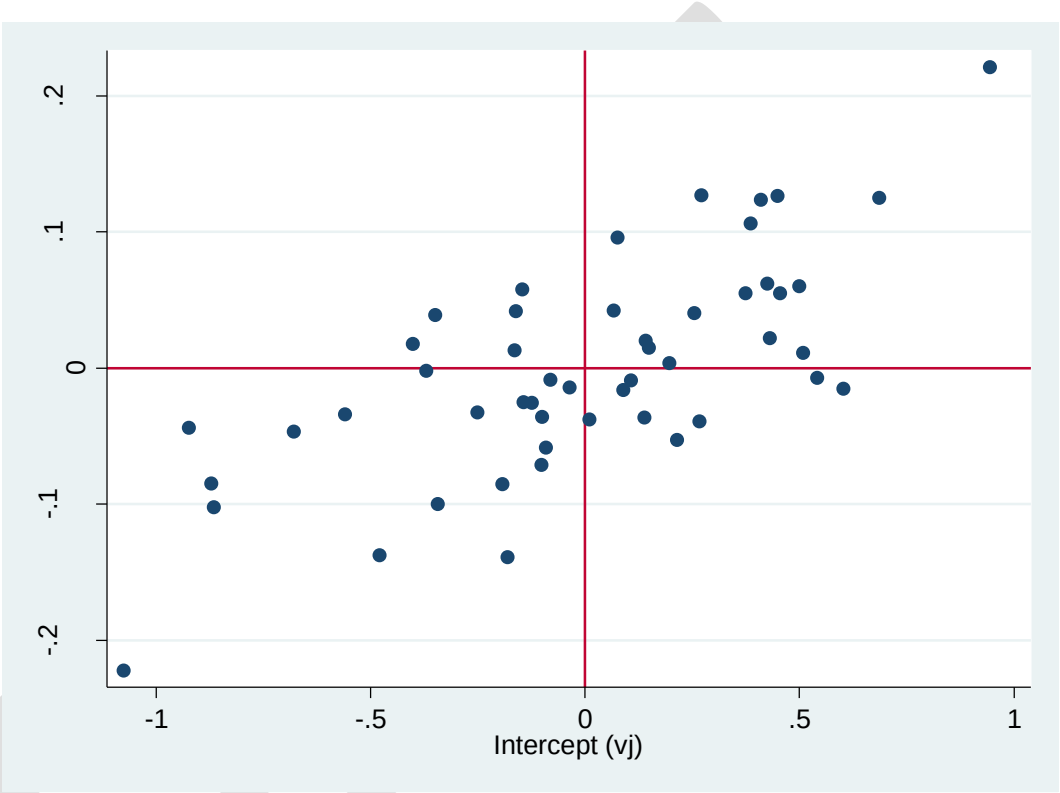

Figure 1. Scatter diagram of district random slopes and random intercepts

Fourth, 39% and 2% of variability in municipal revenue from property tax is due to the district-level effects at the intercept and slope, respectively as shown by the related VPC. Also, 59 % of variability occurs within-district between-municipality all other things being constant in Model 1. Similarly, 41% and 1% of variability of service charges revenue is explained by district-level effects at intercept and slope. These reported VPC suggest that there is a misguide if one does not take into account the district effects on the relationships between revenue from interests earned on investments, property tax and service charges revenues for South African municipalities.

6 Conclusion

This paper analyses the relationships between revenue from interests earned on investments, revenue from property tax and service charges for South African municipalities for the 2015/16

[1] The same applies in the case of the second equation, although results not reported here for space reason.

financial year. The analysis acknowledges the effects that factors at the district level have in explaining the level of revenue from property tax and service charges.

Two-level variance component models are estimated and results point out the existence of positive relationships between revenue from interests earned on investments, property tax and service charges for an average municipality across all districts. This also suggests that the average municipality in South Africa does not use interests earned on investments as a tool to reduce the burden of property tax and service charges. However, due to district-level factors, it is found that there are municipalities that use interests earned on investments to reduce property tax and service charges.

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